Coil Embolization Combined with Stenting for a Giant Basilar Trunk Aneurysm

A Case Report

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Key words: giant aneurysm, basilar artery, coiling and stenting

Summary

A 52-year-old male presented with left oculomotor nerve palsy. Angiograms revealed a giant basilar trunk aneurysm with a maximum diameter of 32 mm and a wide neck of 18 mm, located between the superior cerebellar artery and the anterior inferior cerebellar artery and without opacification of posterior communicating arteries. Intra-aneurysmal embolization of the dome was followed by deployment of a 24mm-long coronary balloon-expandable stent across the neck of the aneurysm.

Additional coil embolization of the aneurysmal neck produced good clinical and angiographic results.

Introduction

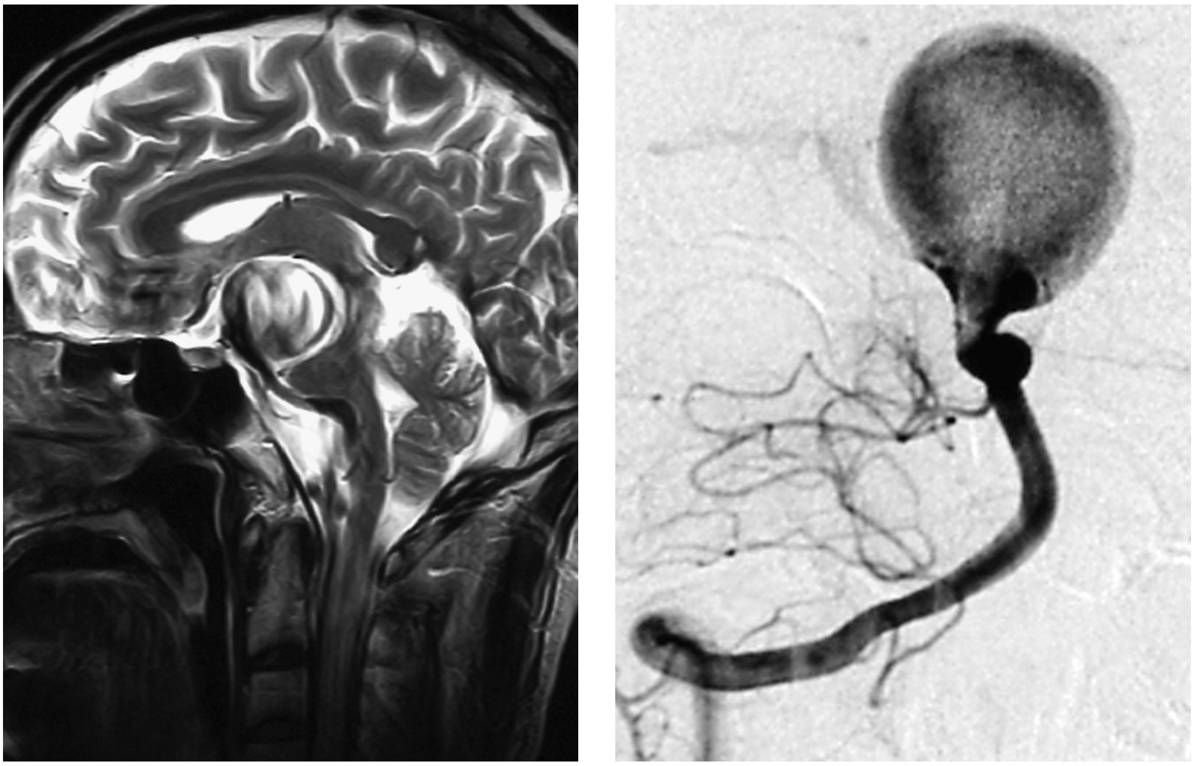
Giant basilar trunk aneurysms are very rare and their treatment remains extremely challenging for both neurosurgery and neurointervention [1-3]. As surgical clipping and coil embolization alone are very rarely successful, alternative treatment options need to be developed and tested. Parent artery occlusion, comprising either or both vertebral artery occlusion and basilar artery occlusion, has been tried for such difficult lesions [4-7]. This report concerns a case treated with coil embolization combined with stenting, which produced good clinical and angiographic results.

Case Report

A 52-year-old male presented with progressive double vision and left ptosis. Neurological examination upon transfer to our department showed left oculomotor nerve palsy, and MRI revealed an extra-axial mass with a maximum diameter of 32 mm, compressing the upper part of the pons and the midbrain (figure 1A). Both vertebral angiograms showed a giant aneurysm in the basilar trunk between the superior cerebellar arteries (SCAs) and the anterior inferior cerebellar arteries (AICAs) (figure 1B,C). The maximum diameter was 32 mm and the neck of the aneurysm measured 18 mm, while the distal and proximal diameters of the basilar artery (BA) were 3.0 mm and 3.5 mm, respectively. Neither carotid angiogram showed any opacification of either of the posterior communicating arteries, nor did either vertebral angiogram during manual compression of both carotid arteries. Because parent artery occlusion, including occlusion of the basilar artery and of both vertebral arteries, was expected to result in a grim outcome under such poor bilateral circulatory conditions, coil embolization combined with stenting was indicated to preserve the parent artery and occlude the aneurysm.

After the patient's informed consent had been obtained, an anti-platelet drug (Ticlopidine, 200 mg) was administered for two weeks before the treatment. During surgery and un-

A



B

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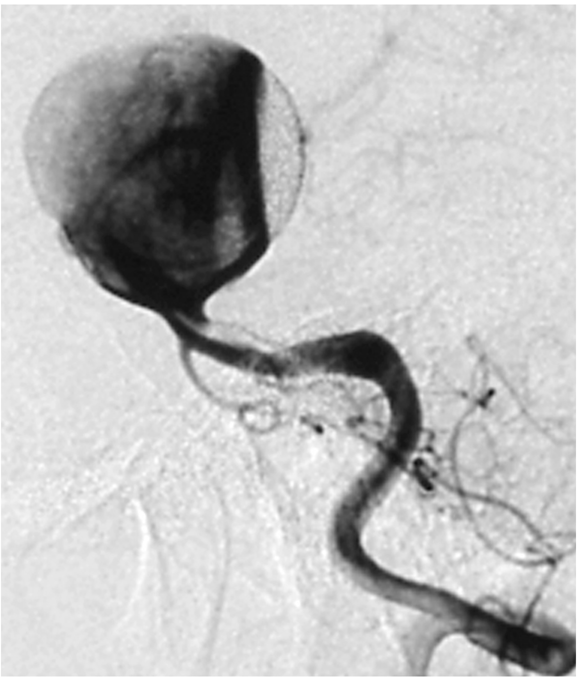
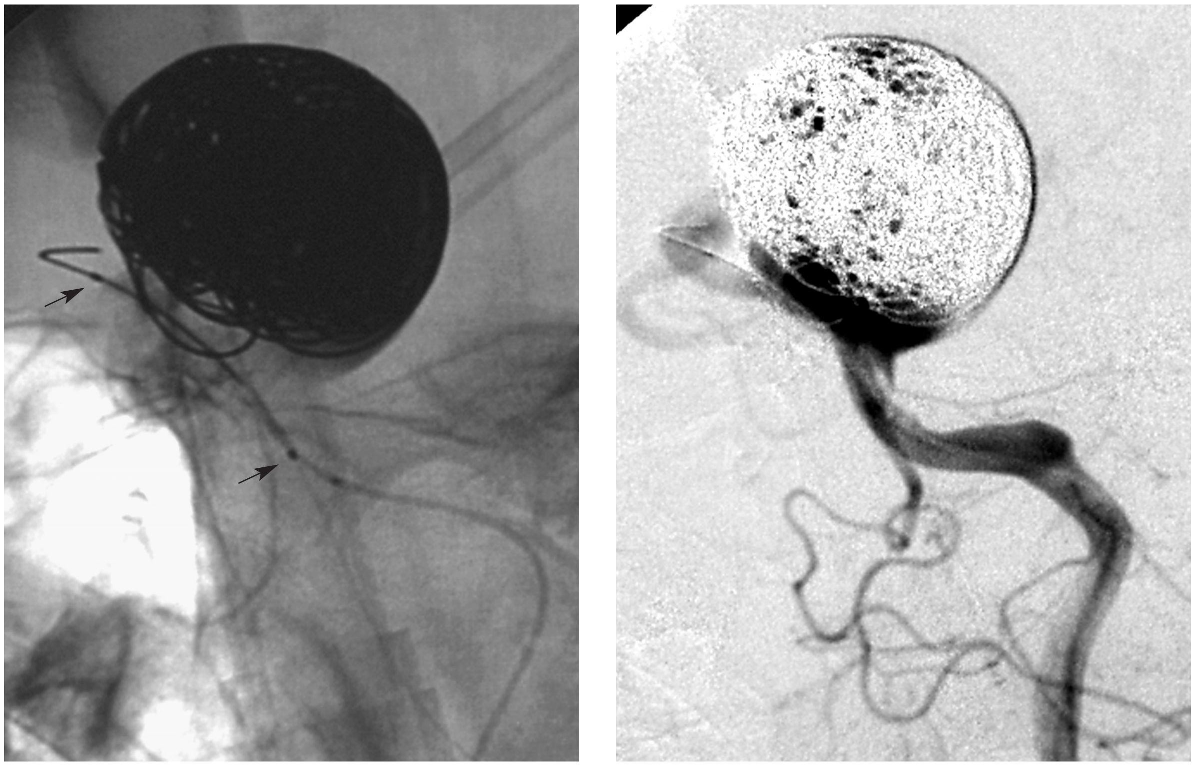


Figure 1 MRI (T2WI) demonstrates a giant aneurysm compressing the midbrain and the upper pons (A). Right vertebral angiograms, antero-posterior projection (B) and lateral projection (C) demonstrate a giant aneurysm located in the basilar trunk distal to the anterior inferior cerebellar artery. The maximum diameter of the aneurysm is 32 mm and the size of the neck 18 mm.

der general anesthesia, 6Fr introducers were placed in both femoral arteries. The two guiding catheters (6Fr Envoy, MPD and MPC; Cordis Corporation, Miami Lakes, FL) were introduced into both vertebral arteries, followed by the placement of two microcatheters (ProwlerPlus45 and Transit II, Cordis, Miami Lakes, FL) over the 0.014inch guide wires (Transend-14, floppy and soft tip; Cordis) into the aneurysm. Guglielmi detachable coils (GDCs; Boston Scientific/Target, Natick, MA) were intertwined with both microcatheters. In all, 25 GDCs were placed into the aneurysm, and patency of the basilar artery was confirmed. A 300 cm-long Synchro 0.014 inch microwire (Boston Scientific/Target) was introduced through the microcatheter placed via the left vertebral artery into the left posterior cerebral artery. This was followed by deployment of a S-670 coronary stent with a size ranging from 3.5 mm to 24 mm (Medtronic AVE, Santa Rosa, CA) into the basilar trunk, and which crossed the aneurysmal neck between the BA proximal to the SCAs and the one proximal to the AICAs (figure 2A,B). The microcatheter was again introduced through the stent strut into the aneurysm, and coils were added into the aneurysmal neck. Post-embolization vertebral angiograms

A B



C

Figure 2 Right vertebral angiograms obtained just before deployment of the stent (S670, size: 3.5 mm-24 mm), confirming placement of the coils in the aneurysmal dome and covering of the neck of aneurysm by the stent (A and B, arrows indicate the distal and proximal markers of the S570-mounted balloon). Post-operative right vertebral angiograms show the patent basilar trunk and minimum opacification of the neck of the aneurysm after additional coil embolization (C).

showed patency of the basilar artery and both AICAs, and minimal opacification of the neck of the aneurysm (figure 2C). Postoperative neurological findings did not indicate any deterioration, but oculomotor nerve palsy remained.

Discussion

Giant cerebral aneurysms account for 5% of all all intracranial aneurysms[1], and comprise saccular, fusiform and serpentine types. The prognosis for untreated giant cerebral aneurysms is extremely poor[2,3]. Within five years of clinical presentation, approximately 80% of patients with untreated giant aneurysms are severely disabled or dead secondary to cerebral and brain stem compression, thrombosis of critical arteries, or subarachnoid haemorrhage (SAH). The treatment of giant basilar trunk aneurysms have been challenging for neurosurgery as well as neurointervention. Because surgical clipping or coil embolization alone is very rarely successful, alternative treatment options, including occlusion of one or both vertebral arteries, basilar artery occlusion, or occlusion of both the aneurysm and basilar artery, have been tried. Steinberg, Drake et Al. reported clinical results for 201 patients with unclippable vertebro-basilar aneurysms, who underwent deliberate basilar or vertebral artery occlusion[4]. Excellent or good clinical results were obtained for 73% of their patients but 24% died, with the clinical outcome depending upon aneurysm site, preoperative grading, and the size of the posterior communicating arteries. Fox et Al. reported clinical results for their treatment of 65 patients with unclippable cerebral aneurysms, including six basilar trunk aneurysms, who underwent proximal occlusion with a detachable balloon[5]. However, our patient showed no opacification of either posterior communicating artery even on the two vertebral angiograms obtained during manual compression of both carotid arteries, indicating that basilar artery occlusion or occlusion of both vertebral arteries would result in a poor outcome.

Another treatment option is aneurysmal occlusion with preservation of the basilar artery, but intra-aneurysmal coiling alone for giant aneurysms cannot initially occlude the aneurysms completely and coil compaction or thrombus resolution over time can be expected to lead to reopening of the aneurysm lumen[6,7]. Although stenting across the aneurysmal neck alone may alter the blood flow around the neck and inside the aneurysm, thus inducing intra-aneurysmal thrombosis and reduction of the shear stress to the aneurysmal wall, its clinical application using stents alone shows a high rate of failed obliteration due to persistent flow[8]. Higashida et Al. were the first to report clinical application of stent-supported coil embolization for a ruptured small fusiform basilar aneurysm in 1977[9]. We intended to occlude the aneurysm at a high occlusion rate as well as to preserve the basilar artery. Coil embolization preceded stenting, because a high occlusion rate could be attained by procedures which allowed for free manipulation with double microcatheters compared with the rate attained with difficult and inconvenient manipulation through the strut of the stent. Once the GDC had been placed near the neck of the aneurysm, a long coronary stent was deployed across the neck and AICs, followed by as much additional coiling around the neck as possible. Postembolization angiograms demonstrated minimum opacification of the neck together with a patent basilar artery as well as patent AICAs. Angiographic and clinical outcomes have been satisfactory so far, but long-term follow-up is essential for such challenging cases.

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